L.T Circuit Breakers

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A **circuit breaker** is an automatically-operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Unlike a fuse, which operates once and then has to be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation.

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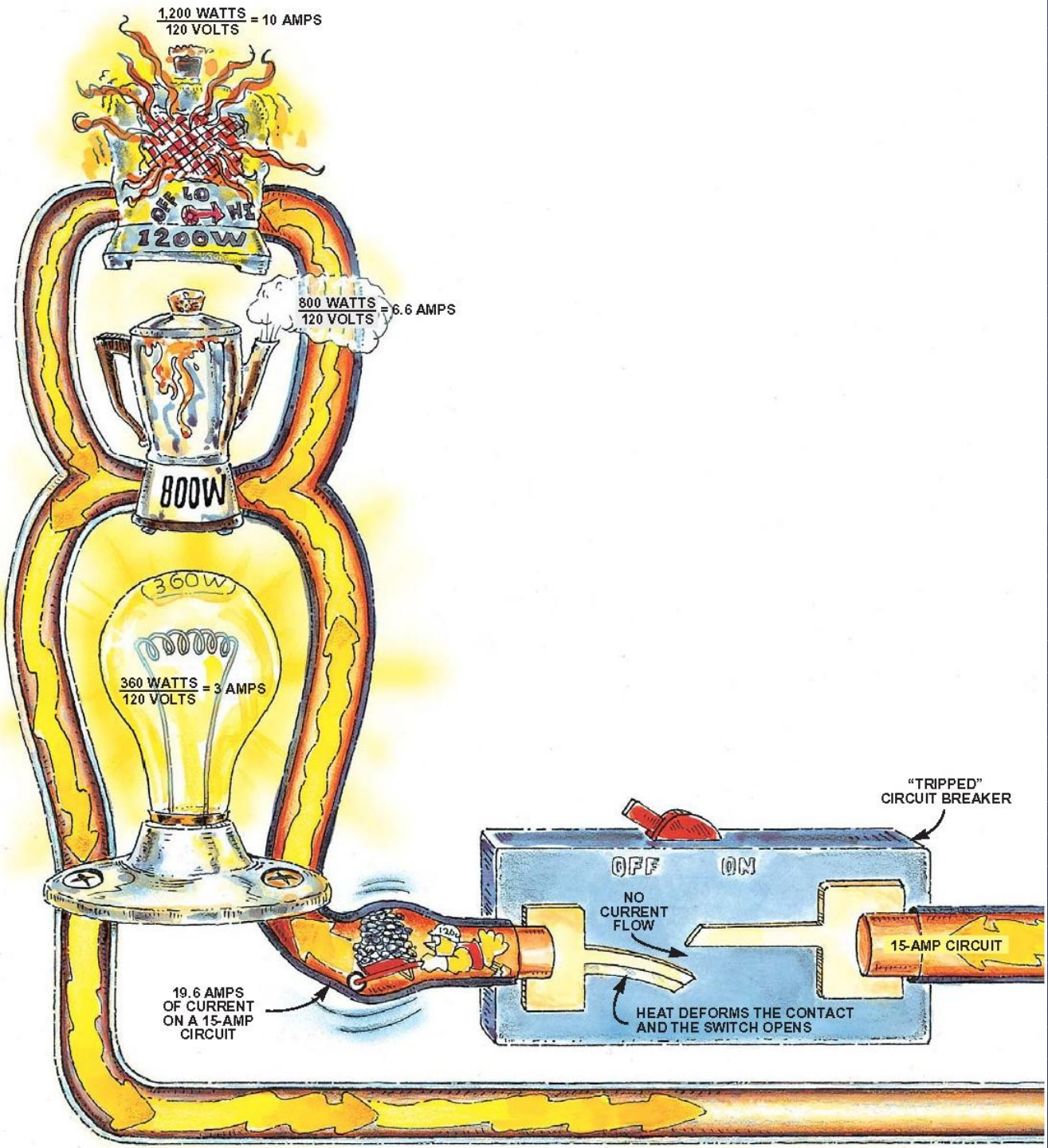
Basic Principle:

When a current supplies enough energy to operate a trigger device in a breaker, a pair of contacts conducting the current are separated by preloaded springs or some similar mechanism.


1,200 WATTS / 120 VOLTS = 10 AMPS
OFF LO HI
1200W
800 WATTS / 120 VOLTS = 6.6 AMPS
800W
360W
360 WATTS / 120 VOLTS = 3 AMPS
"TRIPPED" CIRCUIT BREAKER
OFF ON
NO CURRENT FLOW
15-AMP CIRCUIT
19.6 AMPS OF CURRENT ON A 15-AMP CIRCUIT
HEAT DEFORMS THE CONTACT AND THE SWITCH OPENS

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Because it is usual for an electric arc to form between the contacts when a breaker opens, some means must be provided for preventing rapid erosion of the contacts.

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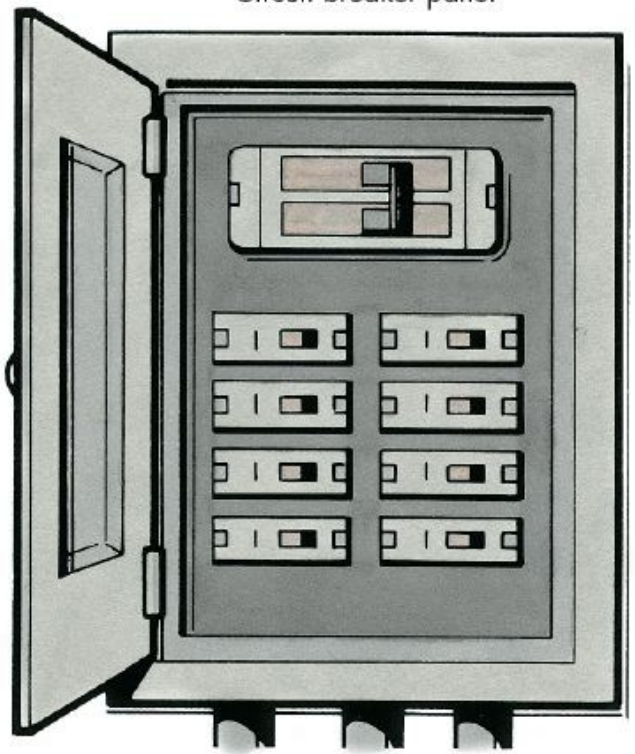
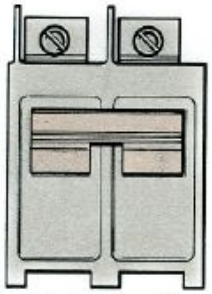
Electrical systems in residential, commercial and industrial applications usually include a panelboard for receiving electrical power from a utility source. The electrical power is then delivered from the panelboard to designated branch circuits supplying one or more loads.

Circuit breaker panel





Main circuit breaker

Single circuit breaker

Double circuit breaker

Push tripped circuit breaker to ON to restore power

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Thermal Circuit Breakers:

In this device, the current flows from the battery terminal, through the bi-metal strip and then to the other terminal. The bi-metal strip is made of two different types of metal which have different coefficients of expansion. This means that one will expand more than the other when the rise in temperature is the same for both pieces. The two metals are bonded to each other. When the strip heats up from the current flow through it, one type of metal expands more than the other.

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When the temperature reaches a given point, the piece will snap into the open position and the current flow will stop.

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Magnetic Circuit Breakers:

Some circuit breakers use a magnetic actuator to trip the circuit. In this type of breaker, the current flow through the electrical device passes through an electromagnetic actuator. When the current flow reaches a preset level (determined by the current rating of the breaker), the magnetic field in the electromagnet is strong enough to trip the breaker and allow the contacts to open. This type of breaker generally has to be manually reset. A well designed 'magnetically' actuated circuit breaker can operate very quickly (possibly as fast as or faster than a fuse of equal current rating).

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Circuit Breaker can be divided into two categories:

- The circuit beaker that trips or breaks the circuit when there is a short circuit or when there is too large current through the circuit.
- The circuit beaker that trips or breaks the circuit when there is small leakage currents from the live wire to the earth wire.

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Types of first Category:

Low voltage (less than 1000 V AC) types are common in domestic, commercial and industrial application, include:

- MCB (Miniature Circuit Breaker)—rated current not more than 100 A. Trip characteristics normally not adjustable. Thermal or thermal-magnetic operation.
  MCCB (Moulded Case Circuit Breaker)—rated current up to 1000 A. Thermal or thermal-magnetic operation. Trip current may be adjustable in larger ratings.

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Miniature circuit breakers (MCBs) :

Circuit breakers used in residential and light commercial applications are commonly referred to as miniature circuit breakers because of their limited size.

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Miniature circuit breakers (MCBs) :

Miniature circuit breakers are similar to moulded case circuit breaker but as their name implies, these are smaller in size and are mostly used for current ratings below 100A. These are normally available in single pole (SP), single pole neutral (SPN), double pole (DP), triple pole (TP), triple pole neutral (TPN), and four pole versions (FP).

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Miniature circuit breakers (MCBs) are fitted in consumer units in place of fuses. They have the advantage that they can be manually reset without having to replace wire as in the case of the traditional fuse. The MCBs have either a button or lever that can be flicked to reset it.

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Moulded Case circuit Breakers:

Moulded case circuit breakers are power switches and they all consist of five main parts.

- Moulded case (frame)
- Operating mechanism
- Contacts and extinguishers
- Tripping elements
- Terminal connections

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Moulded Case: This is external cover of MCCB which houses all the components and is moulded from resin/glass-fiber material. It provides insulation between the live and components and the operators.

Operating switch/mechanism: This is a handle which connects the internal mechanism for ON/OFF/RESET operations.

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Contacts and extinguishers: A pair of contacts comprises a moving contacts and a fixed contacts. The instant of opening and closing impose the most severe duty.

Tripping elements: The function of the trip elements is to detect the overload or short-circuit condition and trip the operating mechanism.

Thermal connections: These connect the the MCCB to a power source and a load

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Thank You